

**Course:****Instrumental Analysis**

|                          |                         |
|--------------------------|-------------------------|
| ECTS                     | 2                       |
| Module status            | directional-facultative |
| Module final assessment  | passing with a grade    |
| Preliminary requirements | not applicable          |

**Field of study:****Food Processing, Safety and Quality**

|                                     |          |
|-------------------------------------|----------|
| Educational profile                 | academic |
| Code of studies and education level | SM       |
| Semester of studies                 | summer   |
| Language                            | English  |

**Teaching module offered by:**

|  |  |
|--|--|
| Name of faculty and department offering the module | Faculty of Food Technology - Department of Plant Products Technology and Nutrition Hygiene |
| Coordinator  | dr hab. Magdalena Surma, prof. URK   |

**Learning outcomes:**

| Symbol of outcome                                      | Description of the learning outcome  | Reference to main field of study outcomes | Area symbol* |
|--|--|---|--------------|
| <b>KNOWLEDGE – the graduate knows and understands</b>  |  |   |              |
| IA_W1  | concepts of analytical chemistry and instrumental methods useful in solving simple tasks   | TŻ1_W01<br>TŻ1_W10                        | RT           |
| IA_W2  | basic aspects of construction and operation of apparatus used in instrumental analysis   | TŻ1_W12                                   | RT           |
| IA_W3  | phenomena and processes used in instrumental analysis, basic concepts and basic theorems and laws  | TŻ1_W01                                   | RT           |
| <b>SKILLS – the graduate is able to</b>                |  |   |              |
| IA_U1  | perform simple quantitative analyses and know how to do them   | TŻ1_U04<br>TŻ1_U07                        | RT           |
| IA_U2  | perform assigned simple experiments, physical/chemical measurements or observations according to instructions and under the direction of the instructor and analyze their results. | TŻ1_U07                                   | RT           |
| IA_U3  | describe and interpret results of performed experiments, present them and elaborate on them e.g. in the form of a report.  | TŻ1_U04<br>TŻ1_U03                        | RT           |
| IA_U4  | follow the basic rules of occupational health and safety.  | TŻ1_U01                                   | RT           |
| <b>SOCIAL COMPETENCIES – the graduate is ready to:</b> |  |   |              |

|       |   |                    |    |
|-------|---|--------------------|----|
| IA_K1 | correctly identify activities to complete a task defined by themselves or others. | TŽ1_K02<br>TŽ1_K03 |    |
| IA_K2 | interact and work in a group, taking on a specific role in the group.             | TŽ1_K02            | RT |

**Classes:**

**Lectures:**

**15 hrs**

|   |   |
|---|---|
| Topics                                    | Introduction to instrumental analysis: steps in the analytical process, quantitative analysis, calibration methods, elaboration of results.   |
|   | UV-VIS spectroscopy, theoretical basis and construction of apparatus.   |
|   | Gas chromatography: equipment (injectors, columns, detectors), choice of analysis parameters, application of GC technique.  |
|   | Liquid chromatography: equipment (pumps, injectors, columns, detectors), stationary phases in high performance liquid chromatography, application of HPLC.  |
|   | Electrochemistry: basics of electrochemical methods, electrode potential - electric double layer, electromotive force.  |
|   | Electrophoretic methods: gel electrophoresis - principle and classification of methods, detection methods, capillary electrophoresis - classification of techniques, equipment construction. Examples of use. |
|   | Mass spectrometry: equipment (sample injection system, ion source, ion analyzer, detector), mass spectra of organic compounds, application of mass spectrometry.  |
|   | Atomic absorption spectrometry: basics of AAS method, equipment, quantitative analysis in AAS method.   |
| Implemented learning outcomes             | IA_W1; IA_W2; IA_W3   |
| Verification methods and evaluation rules | Examination in a written form; at least 51% of the given questions must be answered correctly to get a positive grade. Participation in the final evaluation of the course - 50%.                             |

**Practical classes:**

**15 hrs**

|   |   |
|---|---|
| Topics                                    | UV/Vis spectrophotometry - quantitative spectrophotometric analysis: determination of the concentration of a single component.  |
|   | Atomic absorption spectrometry - determination of Mg content in food by flame atomic absorption spectroscopy.   |
|   | High-performance liquid chromatography - determination of selected polyphenolic compounds in food.  |
|   | Gas chromatography-mass spectrometry - analysis of aroma compounds in food.   |
|   | Gel electrophoresis - determination of molecular weight of proteins.  |
| Implemented learning outcomes             | IA_U1; IA_U2; IA_U3; IA_U4; IA_K1; IA_K2  |
| Verification methods and evaluation rules | Passing the exercises on the basis of: - laboratory reports (all) passed, - partial tests in the field of exercises (positive evaluation after obtaining at least 51% of points) - participation in the final evaluation 50%. |

**References:**

|               |  |
|---------------|--|
| Basic         | 1. Undergraduate Instrumental Analysis. J.W. Robinson, E.M. Skelly Frame, G.M. Frame II; Taylor & Francis Group; 7th edition 2014. |
|               | 2. Principales of Instrumental Analysis. D.A. Skoog, F.J.Holler, S.R. Crouch; Thomson Brooks/Cole; 6th edition 2007.               |
| Supplementary | 1. Handbook of Instrumental Techniques for Analytical Chemistry. F.A. Settle (Editor); Prentice Hall PTR 1997                      |

**Structure of learning outcomes:**

|   |     |       |
|---|-----|-------|
| Area of academic study (discipline): RT – Agricultural science - discipline nutrition and food te | 2,0 | ECTS* |
|---|-----|-------|

**Structure of student activity**

|   |    |      |     |       |
|---|----|------|-----|-------|
| Contact hours   | 34 | hrs. | 1.4 | ECTS* |
| Including:  |    |      |     |       |
| lectures  | 15 | hrs. |     |       |
| classes and seminars                                      | 15 | hrs. |     |       |
| consultations   | 2  | hrs. |     |       |
| participation in research                                 | 0  | hrs. |     |       |
| obligatory traineeships                                   | 0  | hrs. |     |       |
| participation in examination and other form of completing | 2  | hrs. |     |       |
| Student own work  | 16 | hrs. | 0.6 | ECTS* |

\*Areas of academic study in the fields of: RT – Agricultural science - discipline nutrition and food technology

\*\* stated with an accuracy to 0.1ECTS, where 1 ECTS = 25 - 30 hours of classes

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